

REMARKS

Claims 20 and 23-27 have been amended.

No claims have been cancelled.

Claims 1-29 are currently pending in this application.

Claims 1 and 20 are in independent format.

1. Rejections Under 35 U.S.C. § 103(a)

The Examiner's rejection of Claims 20, 28, and 29 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,062,062 to *Nishibe et al.* in view of U.S. Patent No. 5,708,216 to *Garshelis* is respectfully traversed.

Applicant notes that the Examiner's rejection only lists Claims 20, 28, and 29 as being rejected under 35 U.S.C. § 103(a) over '062 and '216 reference, but that the detailed discussion rejects each of Claims 20-29. Hence, Applicant assumes that each of Claims 20-29 is rejected under 35 U.S.C. § 103(a) over the '062 *Nishibe et al.* reference in view of the '216 *Garshelis* reference.

The Examiner's stated basis for the rejection is that the '062 *Nishibe et al.* reference discloses all of the claimed features of the claimed invention but for a magnetoelastic ring press fit to a bearing inner race. The Examiner contends that the '216 *Garshelis* reference teaches a magnetoelastic ring press fit to a shaft, and that therefore it would have been obvious to modify the teachings of the '062 *Nishibe et al.* reference according to the teachings of the '216 *Garshelis* reference for purposes of providing an magnetoelastic torque transducer having a single output signal including shaft torque and speed information, to enable power to be determined from the transducer.

Contrary to the Examiner's stated basis for the rejection, the combination of the '062 *Nishibe et al.* reference and the '216 *Garshelis* reference fails to disclose or render obvious all of the claimed features of the present invention as set forth in independent Claim 20. Specifically, both the '062 *Nishibe et al.* reference and the '216 *Garshelis* references teach shaft torque sensor systems which operate to measure the shaft torque by detecting magnetic changes in a magnetized shaft material (i.e., the '062 *Nishibe et al.* reference at Col. 1, line 64 – Col. 2, line 5) or by detecting magnetic changes at a ring of magnetic material disposed on the shaft surface (i.e., the '216 *Garshelis* reference at Col. 8, lines 10-50). Neither the '062 *Nishibe et al.* reference nor the '216 *Garshelis* reference teaches or suggests the incorporation of torque sensing components into a bearing assembly, or the measurement of shaft torque via the use of torque sensing components, including a magnetoelastic ring coupled to the bearing inner race.

By providing a bearing assembly (40) with integrated torque sensing components (24, 54), the present invention as set forth in amended independent Claim 20 enables torque measurement to be implemented for any type of torque-transmitting shaft onto which the bearing assembly (40) is fitted (Para. [0028]), and does not require either a magnetized shaft or modification of the shaft surfaces. In contrast, the cited prior art references do not incorporate all torque sensing components within a bearing assembly, and require either magnetized shaft materials (i.e. the '062 *Nishibe et al.* reference) or require modification of the shaft surface (i.e. the '216 *Garshelis* reference). As neither the '062 *Nishibe et al.* nor the '216 *Garshelis* reference teaches or suggests the incorporation of torque sensing components into a bearing assembly for measuring

torque in a rotating shaft, the combination of these two references fails to suggest such a modification to a bearing assembly. Hence, as amended, independent Claim 20 is seen as non-obvious and patentable over U.S. Patent No. 5,062,062 to *Nishibe et al.* in view of U.S. Patent No. 5,708,216 to *Garsheinis*.

Dependent Claims 21-29 each depend either directly or indirectly from amended independent Claim 20, and are each correspondingly seen as non-obvious and patentable over U.S. Patent No. 5,062,062 to *Nishibe et al.* in view of U.S. Patent No. 5,708,216 to *Garsheinis* for at least the same reasons as their respective parent claims, and for any additional reasons set forth below.

With respect to Claims 21, and 22 the combined teachings of the '062 *Nishibe et al.* reference with the '216 *Garsheinis* reference fail to render obvious the inclusion of any magnetoelastic components of a torque sensor on a bearing inner race element. Rather, the '062 *Nishibe et al.* reference relies exclusively upon the magnetic nature of the rotating shaft itself to provide input to a sensor, and the '216 *Garsheinis* reference teaches to dispose a ring of magnetoelastic material on shaft itself. Hence, the cited combination of references fails to render obvious the incorporation of a ring of magnetoelastic material at either the small end of a tapered inner race (Claim 21), or the large end of a tapered inner race (Claim 22), and hence these claims are seen as allowable over the cited references under 35 U.S.C. § 103(a).

With respect to Claims 23-26, the Examiner contends that the '062 *Nishibe et al.* reference discloses a sensor which comprises an excitation coil 16 and a sensing coil 20 that are packaged into a single unit 600 mounted to, and within, the outer race 510 and a holder ring 610, 640. However, a review of Figure 35, cited by the Examiner, and

the supporting disclosure, reveals that the single sensing unit 600 is not mounted to or within the bearing outer races 510, but rather is disposed between two axially displaced bearing assemblies 500. The holder ring 610 merely serves as an outer cylindrical housing which holds the bearing assemblies 500 at axially spaced positions, and the sensing unit 600 in place there between. (Col. 36, lines 55-61). None of the sensor components shown in the ‘062 *Nishibe et al.* reference are disposed within the bearing outer races (510), and hence, the cited combination of references further fails to render obvious the limitations of dependent Claims 23-26 under 35 U.S.C. § 103(a).

With respect to Claim 27, the Examiner states that the ‘062 *Nishibe et al.* reference discloses the use of a second excitation coil (16) and second sensing coil (20), citing Col. 40, lines 3-13. As amended, Claim 27 clarifies that that the second sensing unit and second magnetoelastic ring are axially displaced from the first sensing unit and ring. (Fig. 10A, 10B). In contrast, the ‘062 *Nishibe et al.* reference at Col. 40, lines 3-13 describes the use of multiple sensors which are disposed in a common axial plane, but which are radially spaced about the circumference of the rotating shaft. (Fig. 36, Col. 40, lines 3-7). Hence, the teachings of the cited references, and of the ‘062 *Nishibe et al.* reference in particular, fail to render obvious the limitations of amended Claim 27 under 35 U.S.C. § 103(a).

2. Allowable Subject Matter

The Examiner’s indication of allowance for Claims 1-19 is respectfully acknowledged.

3. Conclusion

Based on the foregoing, the allowance of all remaining claims is requested. If for any reason the Examiner is unable to allow the application on the next Office Action and feels that an interview would be helpful to resolve any remaining issues, the Examiner is respectfully requested to contact the undersigned attorney for the purpose of arranging such an interview.

Respectfully submitted,

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